

LEAN PROJECT MANAGEMENT

Visual Management Tools



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ABSTRACT

This thesis is about Lean Project Management with the main focus on Visual Management Tools. Commissioning company is Parker Hannifin Manufacturing Finland Oy. More precisely the customer of this thesis is the Parker Forssa unit and the Product Engineering Department. This topic is very current at the moment and it was a prerequisite from the customer to focus on lean project management tools.

Main objectives of this thesis are examining the current situation of the project management tools at the Product Engineering Department at Parker Forssa, exploring how the project management could be improved by lean visual management tools, and finally provide a plan how to utilize, monitor, and sustain the visual management tools.

Ronald Mascitelli, the author of Mastering Lean Product Development, has studied product development for decades and he has developed lean methods and visual management tools as well as implemented them in several companies. His expertise and theory have been applied in this thesis. As a part of this thesis, Mascitelli's visual project board concept was implemented at Parker Forssa. For six weeks the use of the visual project board was observed and after the observation period a survey was conducted.

Survey results were positive; all the engineers and the managers related to the implementation of the visual project board replied in the survey that this method should be continued in the Product Engineering Department. Modifying the visual project board from the current single-project visual board to a multi-project visual board is recommended. Also integrating the visual project board with the actual project plan in electrical format is a recommended further action for the commissioning company.

Keywords Lean, project management, product engineering, visual management tools

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TIIVISTELMÄ

Tämä opinnäytetyö käsittelee lean-ajattelun mukaista projektinhallintaa ja huomio kohdistuu erityisesti visuaalisiin projektinhallintatyökaluihin. Työn toimeksiantaja on Parker Hannifin Manufacturing Finland Oy. Tarkemmin määriteltynä tämän työn varsinainen asiakas on Parker Forssa yksikön tuotekehitysosasto. Aihe on hyvin ajankohtainen ja asiakkaan toiveena oli keskittyä nimenomaan lean-ajattelun projektinhallintatyökaluihin.

Opinnäytetyön tavoitteet ovat Parker Forssan tuotekehityksen nykyisten projektinhallintatyökalujen selvittäminen, tutkia mahdollisuuksia projektinhallinnan kehittämiseen lean-ajattelun mukaisilla visuaalisilla projektinhallintatyökaluilla ja lopuksi tarjota suunnitelma, kuinka hyödyntää, seurata ja ylläpitää visuaalisia projektinhallintatyökaluja.

Ronald Mascitelli, teoksen Mastering Lean Product Development kirjoittaja, on tutkinut tuotekehitystä vuosikymmeniä ja kehittänyt lean-ajattelua ja visuaalisia projektinhallintatyökaluja sekä toteuttanut niitä useissa yrityksissä. Hänen asiantuntemustaan ja teoriaa on hyödynnetty tässä opinnäytetyössä. Osana tätä opinnäytetyötä Parker Forssassa toteutettiin Mascitellin kehittämän konseptin mukainen visuaalinen projektitaulu. Visuaalisen projektitaulun käyttöä seurattiin kuuden viikon ajan ja seurantajakson jälkeen toteutettiin kysely.

Kyselyn tulokset olivat positiivisia; kaikki visuaalisen projektitaulun toteutukseen osallistuneet insinöörit ja projektipäälliköt vastasivat kyselyssä, että tätä metodia tulisi jatkaa tuotekehitysosastolla. Visuaalisen projektitaulun muuttaminen nykyisestä yhden projektin taulusta useamman projektin sisältäväksi tauluksi on suositeltavaa. Myös visuaalisen projektitaulun yhdistäminen sähköisen projektisuunnitelman kanssa on suositeltu jatkotoimenpide toimeksiantajalle.

Avainsanat Lean-ajattelu, projektinhallinta, tuotekehitys, visuaalinen projektinhallinta

Sivut


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1 INTRODUCTION

This thesis explores the topic of Lean Project Management focusing on the Visual Management Tools. The commissioning company is Parker Hannifin Manufacturing Finland Oy. The emphasis of this thesis is on the product development projects so the actual customer of this thesis is the Product Engineering Department of Parker Forssa. This thesis begins with the objectives of the thesis work and general information on the commissioning company as well as historical information about the Forssa unit. After the presentation of the research methods there is the theory section of the thesis and a presentation of the current situation and challenges. Towards the end of this thesis, there is a description of the practical testing of a visual project board and a development plan and recommendations for the future.

1.1 Background information

This topic is very current at the moment as the familiar lean methods from the production side are increasingly implemented also into other areas. Also at Parker Forssa the development has been the same; lean principles were first implemented in the production before these spread to the Product Engineering department and the product development projects.

At Parker Forssa they have a clear need for evolving the Product Engineering towards more lean functions and a group of employees from Parker Forssa actually participated in a lean training in Winnipeg, Canada. So Parker Forssa has a good start on the journey towards a lean Product Engineering Department and this thesis is supporting that goal. The purpose of this thesis is to explore the subject of lean project management and especially visual management tools, which was a prerequisite from the customer of this thesis.

1.1.1 Objectives

The main objectives of this thesis are:

- Examine the current situation of the project management tools at Parker Forssa, Product Engineering Department.
- Explore how the project management could be improved by lean visual management tools.
- Plan how to utilize, monitor, and sustain the visual management tools in order to achieve the best results.

First the current situation and challenges need to be examined in order to plan the best approach for implementing lean principles suitable for this specific customer and the customer's requirements.

1.2 Research methods

In order to provide answers to the main objectives set for this thesis, theoretical information about lean project management and visual management tools needs to be gathered. Also qualitative research information is collected from a specific group of Parker Forssa employees with knowledge about the current situation with the project management tools. Project Managers are interviewed in order to get a sense of the current situation and the challenges or problems that they have observed.

As a part of this thesis work a Visual Project Board is set up at Parker Forssa Product Engineering and for the first six weeks the implementation of this team board is observed. During those six weeks also the notes used with the board are gathered for analyzing how many times tasks are postponed for various reasons, which consequently creates challenges for the project timeline. To obtain qualitative information from the employees involved with the Visual Project Board interviews will be conducted before and after the six weeks testing period. After the testing period a survey is also carried out in order to get more information on how this new lean visual management tool was experienced.

1.3 Parker Hannifin Manufacturing Finland Oy

1.3.1 Parker Hannifin Corporation

Parker Hannifin Corporation is a worldwide organization that offers services to customers in 55 countries. Parker Hannifin designs and delivers innovative motion and control products including systems. The company vision is to be the number one Motion and Control Company in the world. Their company values include a winning culture, passionate people, and valued customers as well as engaged leadership. Parker's main focus is on their customers and in improving their efficiency.

The beginning of Parker took place in 1918, when Arthur Parker founded the Parker Appliance Company. In 1957 Parker merged with the Hannifin Company and 50 years later Parker Hannifin reached 10 billion dollars in sales. Today Parker Hannifin has technology expertise in nine different fields of technology and annual sales exceeded 13 billion dollars in fiscal year 2014.

Parker Hannifin's fields of expertise include aerospace, climate control, electromechanical, filtration, fluid and gas handling, hydraulics, pneumatics, process control, sealing and shielding. Key markets for Parker Hannifin include agriculture, aerospace, military, forestry, mining, power generation, industrial machinery, factory automation, marine, air conditioning and transportation among many others.

Parker is also thriving in environmental issues. Parker Hannifin's innovative technologies are generating energy in a clean and efficient way that safeguards the environment. Parker is also reducing its own energy use as

well as water consumption in addition to minimizing waste generation. Parker is also taking action towards protecting natural resources and all these environmental aspects are annually followed for continuous improvement purposes.

Parker Hannifin Corporation has divided their operations into different groups of technology expertise, which contain several divisions that have their own focus points. Parker Hannifin Manufacturing Finland Oy is one company under the Parker Hannifin corporation umbrella and it is located in Forssa. This unit belongs to the Hydraulics Group and under that the Electronic Controls Division.

1.3.2 Electronic Controls Division

Electronic Controls Division has units in North America, Europe and Asia. In Europe there are two R&D locations, which are positioned in Mölnlycke (Sweden) and in Forssa. The total number of Parker employees at the Forssa location is 34.

The market segments of Electronic Controls Division include agriculture, construction, transportation, forestry, marine and material handling. Electronic Controls Division offers products and solutions essentially to any electrical and electronic systems for mobile vehicles which has resulted a diverse customer base.

1.3.3 Parker Forssa unit

The history of the Forssa unit started in 1988, when two entrepreneurs, Heino Ruottinen and Juha Siitonen, established Mitron Oy. Mitron Oy was specialized in automotive electronics and developing public transportation information systems. For example LCD-displays were designed and produced for busses, trams, railway stations, etc.

In October 2005 Vansco Electronics LP acquired a part of Mitron Oy. The other operations of Mitron Oy transferred to other facilities after the acquisition and there Mitron Oy is still operating. The CEO of Vansco Electronics LP at that time commented that this was a strategic acquisition for Vansco. Vansco gained highly educated and dedicated workforce in electronics design as well as production in addition to strong customer base. This was also the first Vansco Electronics unit in Europe, which benefitted the European market.

Just a few years after Vansco had bought part of Mitron Oy, Parker Hannifin Corporation acquired Vansco Electronics LP in April 2008. Vansco was a highly acknowledged designer and manufacturer of electronic controls, displays and terminals, communication and operator interfaces as well as sensors for mobile equipment. So as a result of this acquisition the Forssa unit is now also part of Parker Hannifin Corporation and the new company name is Parker Hannifin Manufacturing Finland Oy.

2 LEAN PROJECT MANAGEMENT & PRODUCT DEVELOPMENT

2.1 Development of Lean Project Management

Before diving any deeper into Lean Project Management, it is good to define what lean is and what project management is, even though the concepts of these two might seem simple. The benefits of paring lean with project management and the relationship between them will become more evident after the history and definitions of these two have been considered.

2.1.1 Lean

The starting point for lean was the Toyota Production System. Toyota Production System was developed in Japan and is Toyota's internal production philosophy which intrigued Western researchers at the end of the 1980s. The term 'lean' was actually assigned by the Western researchers so essentially it is a separate concept from the Toyota Production System. Lean has in a way evolved from the researchers' observations of the Toyota Production System. (Modig & Åhlström 2013, 75.)

Defining lean in a general sense is almost impossible these days as the term lean is now used in so many ways and in different contexts. Lean started from the production environment but now the concept of lean has spread to all business areas. Almost anything can be lean today, so there is not a one clear definition that would apply to all implementations of lean. There are some characteristics of lean that are commonly known and associated with lean, even though those characteristics might be fulfilled and explored in different ways.

One of the main aspects of lean is continuous improvement. With a business development project improvements can be achieved, but quite often when the project ends the gained results diminish over time. Implementing lean methodology is not a project with a start and an end, it is continuous development. Implementing lean should involve the whole staff and the development should be organized and regular. All the current procedures and processes can always be questioned and improved to minimize waste and actively prevent mistakes. (Kajaste & Liukko 1994, 9–11.)

Minimizing waste and errors are also recurring topics in lean visions. Focus is on value adding functions and more precisely on adding value to the customer. Key factors are quality, cost and time as well as ability to adapt to changes. Products are developed with the customer requirements as the starting point and different phases of the product development are done in parallel, which consequently reduces errors and is time efficient. If for instance marketing, product engineering and production collaborate and work at the same time with a new product, valuable information can be communicated during the process and the launch of the end product can be achieved in a timely manner, which is vital in the current markets. (Kajaste & Liukko 1994, 8–9.)

2.1.2 Project Management

Today people are increasingly interested in project management, which before included only providing schedules and information about resources to the upper management. Project management was mainly utilized only in the military and construction industries before project-based organizations. (Schwalbe 2009, 2.) Nowadays the word ‘project’ seems to be in popular use all around the world whether it is a work related effort or a personal endeavor. Also what is included in project management has broadened quite significantly, which also obviously increases the expectations set for project managers.

A project has a set of objectives and the aim is to reach them in a defined timeframe. Schwalbe (2009, 9–10) presents nine project management knowledge areas, which are the main competencies required to achieve the set project objectives. Four of them are defined as core knowledge areas as they lead to particular project objectives. These core knowledge areas are scope, time, cost, and quality management. Simply put the purpose of them is to ensure that the required work is comprehended and executed with satisfactory results and that there is an adequate schedule as well as a budget for the project. On top of these, there are four facilitating knowledge areas which are a set of processes utilized in order to achieve the project objectives. These facilitating knowledge areas are human resource, communications, risk, and procurement management. Main focus points of these knowledge areas are to effectively employ the people included in the project, managing project information (generating, storing, distributing, etc.), handling related risks (e.g. identifying, analyzing, reacting) and also acquiring products and services for the project. The ninth knowledge area is project integration management which affects all the eight knowledge areas mentioned above and it is also affected by all of them. It is a central function which involves coordinating all the other knowledge areas.

Keeping up with all the different areas included in project management requires constant tracking and reviewing from the project manager. Project manager needs to make sure that the project is on the right track and in order to assure that it is important to have project control and monitoring tools, which are suitable for the type of project in question. Another important factor is that the project team is committed and motivated to perform to the highest standards. There are many different tools developed with the purpose of assisting project management, for example Gantt chart and the work breakdown structure (WBS). (Young 2007, 207.)

2.1.3 Lean Project Management

Project management has been studied, analyzed and developed for a long time as have also the project management tools. Due to the success of lean in the manufacturing world and after that also other aspects of businesses, lean found its way to also project management and project management tools. But as the manufacturing is dependent from the product development phase, it means that the effort invested in implementing a lean manu-

facturing will never achieve its full potential if lean principles are not implemented also in the product development projects. Challenge is that the lean methods implemented in manufacturing do not support the new product development phase, which is project-based. (Mascitelli 2011, ix.)

Consistent with the lean principals, the lean project management should be efficient and eliminate waste. Therefore one really important aspect of lean project management is focusing on creating value. When developing project management towards lean methodology, it means challenging the conventional way of managing project work. Generally the conventional way of managing project work is the project manager telling people what to do and receiving the reports of the work done. Subordinates comply with what is requested from them and then report to the project manager. This means that the project manager takes responsibility of what should be done, even though quite often the subordinate has the best knowledge of what should be done. For example the developers have most knowledge and feedback on the analysis, simulations, and testing as well as have the hands-on experience. Conventional management creates waste by separating responsibility from action, knowledge, and feedback. Waste is also created, and consequently value diminished, by making people to work for bureaucratic priorities instead of the customer. Also the knowledge and abilities of the project managers decay and they end up creating waste instead of value. Focus should be in the requirements of the customers' and the whole team should work towards that. (Ward 2007, 155–156.)

Efficiency and effectiveness are also critical aspects of communication. Studies show that in some conventional companies significant amount of time is spent dealing with e-mails, voice mail, and looking for information. Also a large part of the work day is spent in meetings. When hours and hours are spent in these activities daily, a big portion of this time is most likely waste. Ward (2007, 190) states four keys to better communication, which are actually quite simple solutions for improving company communications to more efficient and effective form. First one is using semi-standard and mostly one-page formats. Lean organizations also cut the number of these down. So instead of having large number of long forms, there are only the necessary ones and they are easy and fast to use and understand. Second one is focusing on the important facts and logic. Third one is using the appropriate medium whether it is words, numbers, pictures, graphs, or equations. Using visual information and visual management tools is essential in implementing lean in project management and efficient communications. Visual information is actually something that the brain can process better than any other type of information. Fourth one is preparing for meetings efficiently as well as conducting the meetings efficiently. (Ward 2007, 190–191.)

2.2 Lean Product Development

First step of lean product development is to understand who the customer of the development is and what it is that the development produces. The primary customers of the development value stream are the operations departments, and operational value streams are produced by the development

value stream. What this means is, that the operational value streams, which go through suppliers and factories to product features and lastly to customers, are created by the development processes. All the drawings, analysis, prototypes, and testing have value only if they create quality operational value streams, which result to better products for the end customers. (Ward 2007, 10.)

What lean development needs to do, in order to produce profitable operational value streams, is focus on creating usable knowledge and equipment, which support the effort. What lean development needs to know is what the customers want and how to make the most of the development competence to provide, what is wanted, and beat the competition. In order to succeed it is also important to consider the aesthetics of the products and how to integrate the products into the legal and physical environment. Additionally lean development must know the suppliers with their capabilities as well as limitations and how to incorporate these to the system. (Ward 2007, 62.)

Improving the knowledge of the whole value stream and creating value requires learning. At the heart of lean development are simple steps to learning. Those steps are go see, ask why and form, what has been understood, and then inform it to others. One must actively go and see in order to find new knowledge, whether it is an experiment or a discussion with a customer. After seeing, the next step is to ask why; what is the cause of what is seen? Last steps are forming the new understanding and knowledge, which is followed by informing it to others, in order to expand the learning process. (Ward 2007, 63.)

These simple steps to learning are at the core of a circle, which includes six parts that go in a bit deeper and embody the fundamental value creating circle. These six parts are to observe, invent, test, abstract, connect to theory, and teach. Going through these six phases should be a continuous cycle and in order to be effective, none of them should be passed. With the purpose of gaining competitive advantage, it is essential to discover new principals, as the existing ones are also already known by the competition. (Ward 2007, 64.)

2.3 Knowledge value and waste in Lean Product Development

As mentioned in the previous chapters, continuous improvement and learning are key things in lean product development. The right knowledge is needed in the right place at the right time to avoid, or at least reduce the number of, defective projects and to create profitable operational value streams. There are three types of learning, which create usable knowledge, and those types are integration learning, innovation learning, and feasibility learning. Integration learning helps to understand how to incorporate the needs of others, especially the customers, to the design by learning about the customers as well as suppliers, partners, and the physical environment, where the product will be used. Innovation learning is all about developing something new and exploring new potential solutions. Feasi-

bility learning guides to make better decisions concerning the new potential solutions, so that cost, quality, and schedule problems can be avoided. (Ward 2007, 18.)

Identifying and eliminating waste are also core principals in lean development. These actions should be applied also with knowledge. Learning to see the wastes of knowledge helps with deciding if change is needed and what to change, identifying what can be changed straightaway, understanding the lean system, and continue to improve amongst other things. There are several benefits with acknowledging the waste, including the ability to execute improvements to development processes in timely manner without many complex analytical tools. (Ward 2007, 29.)

According to Ward (2007, 31) there are different types of knowledge waste and he has categorized the knowledge wastes into three primary categories, which all have two subcategories. The three primary categories are scatter, hand-off, and wishful thinking. Scatter includes communication barriers and poor tools. Hand-off also has two additional categories, which are useless information and waiting. Wishful thinking consists of testing to specifications and discarded knowledge. These different types of knowledge waste often take place together, which means that one standard development practice causes all main categories of knowledge waste.

3 VISUAL MANAGEMENT TOOLS

Visual management tools are an important part of most lean implementations and there are several different ways how to utilize visual management tools for various purposes in diverse environments. A visual management tool can be as simple as colored tape in an office environment indicating if a file is missing or if paper should be ordered but it can also be a highly advanced tool as long as the utilization is clear and efficient. In the following chapters visual management tools related to workflow management are presented.

3.1 Visual Project Board

Mascitelli (2011, 88–89) introduces a proven format for visual workflow management and that is a visual project board. The main idea of a visual project board is to provide information concerning the status and the progress of a project so simply that it can be comprehended quickly and is also understandable for the team members as well as the upper management. Lean aspects are considered in the quick and easy use of this visual management tool. These are achieved with the visual and simple form as well as in the effort of improving efficiency and direct communication, hence reducing waste. One of the key things is keeping it simple and clear, because if it takes too much time to maintain, it is creating waste instead of reducing it. With the experience of two decades evolving this tool, Mascitelli recommends a visual project board including such sections as planned work, unplanned work, project timeline, problem solving, parking lot and the main segment is the wall-Gantt.

The planned work and unplanned work sections entail work commitments set for the project team. Planned work includes project milestones, which have been scheduled at the beginning of the project, and if everything goes according to plan and expectations this list of work would be all that the project team has to accomplish. In the real world this is rarely the case, so that is why there is the unplanned work segment included in the board. All the unexpected tasks are listed in the unplanned work and it should be considered that if the amount of unplanned work is significant it might require revising the project plan. (Mascitelli 2011, 90.)

In order to incorporate the time constraints into the visual project board it is important to have a visual presentation of the scheduled project milestones. This project timeline presentation should not include every milestone, just the most important ones creating the critical path of the project. There are several options on how to include the project timeline in the visual project board, but it is best to choose one that is understandable for all users of the board and not just for people with knowledge on project management tools. One very visual and simple option is a graphical presentation of the timeline as a line chart. The line chart would include time in the y-axis, milestones in the x-axis and preferably two lines; the planned and the actual. Therefore, if there is vertical variance between these two lines, it indicates that the project is either ahead of schedule or running behind. (Mascitelli 2011, 94.)

It is recommended that there is also a blank space in the visual project board for sudden issues, a so-called parking lot, where issues can be noted with a sticky note at any time and then addressed in the next meeting. An additional option is to include also a problem solving area into the board, which could be developed throughout the project and utilized in the upcoming projects as well. This section would be a knowledge base with problem solving briefs to critical issues. When choosing which sections to include into the visual project board the requirements and intended use as well as users should be considered. Additional information can be added into the board if it is beneficial for the team, but this should not be done hastily to avoid clutter and shifting focus from the vital information. The heart of the visual project board is the wall-Gantt which will be described in the following chapter. (Mascitelli 2011, 96–97.)

3.2 Wall-Gantt

As mentioned earlier, the wall-Gantt is the main part of the visual project board. It is an interactive visual management tool of workflow designed to involve all team members in the planning of short term activities. At the beginning of the week, the wall-Gantt section shows, which tasks are completed in a two-week interval and what has been scheduled for the near future, but takes more than two weeks to complete. Tasks are entered in the wall-Gantt on sticky notes by the team members themselves to inspire commitment and efficiency. Each team member has a row assigned specifically for them to place the sticky notes to. So the number of horizontal rows is equal to the number of team members (including the project

manager) and the number of vertical columns is determined by the number of weekly meetings. There is one column for each meeting day in the two-week window and one additional column called 'Week 3+' for the tasks that have a deadline in the near future but not during the following week. (Mascitelli 2011, 97.)

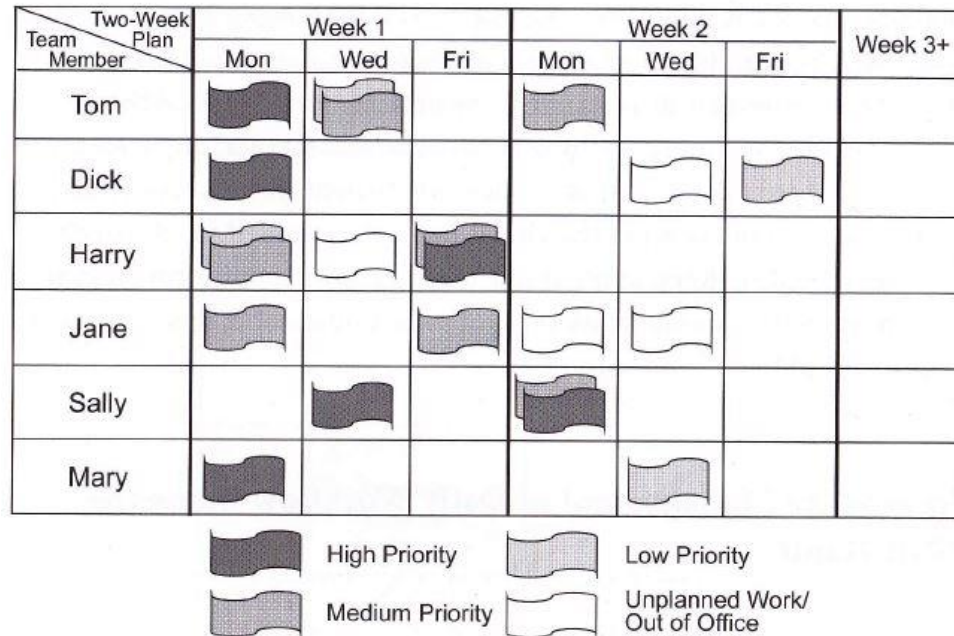


Figure 1 Example of a wall-Gantt layout. (Mascitelli 2011, 98.)

As can be seen in Figure 1, the use of sticky notes, which come in many different colors, enables the use of different colors as indicators. The color of the sticky note can indicate if the task is really urgent and should be handled first or something that can be postponed if necessary. Different colors can be used on the board to give additional information, like is anyone on holiday, with just a quick glance, if it is decided to put for example a pink sticky note to indicate if someone is out of the office. Different colors can also be used to categorize what type of task is in questions, if it brings additional value for the team. (Mascitelli 2011, 99.)

The way this wall-Gantt is operated is through stand-up meetings held at the visual project board. The project manager or team leader calls up everyone one by one to the board. Each team member will check their notes put up on the board for that day. There are three choices, what to do with the notes. If the task is done, the note is handed over to the team leader, and if it is not, there are two choices left on how to proceed. If the person has too much on and it is decided that there is someone who can help, the note can be moved to another team member's lane. In this case the name is lined through and the new name is written on the sticky note. If it is decided, that the task has to be moved forward, the completion time is lined through and the new date for completion is added below and the note is re-located on the board. Usually there will also come up new tasks in the meeting, which everyone should write by themselves. Each sticky note should have the name of the person responsible, short description of the task, and the completion date. At the end of the stand-up meeting, the col-

umn for that day should be empty. As all of this is done with the whole team present, everyone is aware what is happening and when as well as what has been done. There should not be any changes on the wall-Gantt between stand-up meetings. (Mascitelli 2011, 100–101.)

3.3 Stand-up meetings

Mascitelli (2011, 82) got the idea of implementing stand-up meetings with an unproductive project team from a factory shift-change meeting. Stand-up meetings are actually really widely used for example in restaurants, hospitals, and law enforcement. It is an effective way to synchronize and coordinate tasks as well as communicate, resolve issues, and adapt to current conditions. These stand-up meetings are held frequently but quickly therefore raising a sense of urgency and positive peer pressure to be productive.

Stand-up meetings are really important part of the visual workflow management. It is the other half of it, when the other half is visual management tools, which display the current state of tasks and facilitate real-time planning. This combination of stand-up meetings and visual project boards can lead to a really significant increase in the team effectiveness and productivity. The concept of visual communication has been used in different forms for centuries and more recently it was essential in the development of Toyota Production System. (Mascitelli 2011, 83.)

One really important thing to remember, when having stand-up meetings, is the pace. Meetings should be quite short, fifteen minutes is almost the limit as everyone is standing the whole time, and it should move forward so that information is exchanged efficiently. The agenda of the meeting is always what has happened after the last meeting, what should be done before the next meeting and what are the risks, which might prevent meeting the deadlines. The idea is not to go to too much detail, if some discussion topics come up, they should be continued with only the related people after the stand-up meeting or another meeting should be scheduled, depending on the needs regarding the topic. (Mascitelli 2011, 84.)

The frequency of the stand-up meetings should be decided based on the pace of the project, so first it should be considered how fast things change in the project. Also the frequency of the meetings should change accordingly during the project work, depending on the state of the project. If there is not much to report in the stand-up meeting, it indicates that meetings are held too frequently, but if lot happens between meetings, the frequency should be increased. Predicting when to increase the frequency of the stand-up meetings is worthwhile, for example before major milestones, gate reviews or prototype tests, in order to prevent waste and errors occurring. In Figure 2, there are guidelines for meeting frequencies in different circumstances. Timing of the meeting should also be considered carefully, with the aim of getting the most out of the meetings. For example late afternoon, when people are ready to go home, is not likely to be the best time to have the stand-up meeting. (Mascitelli 2011, 85–86.)

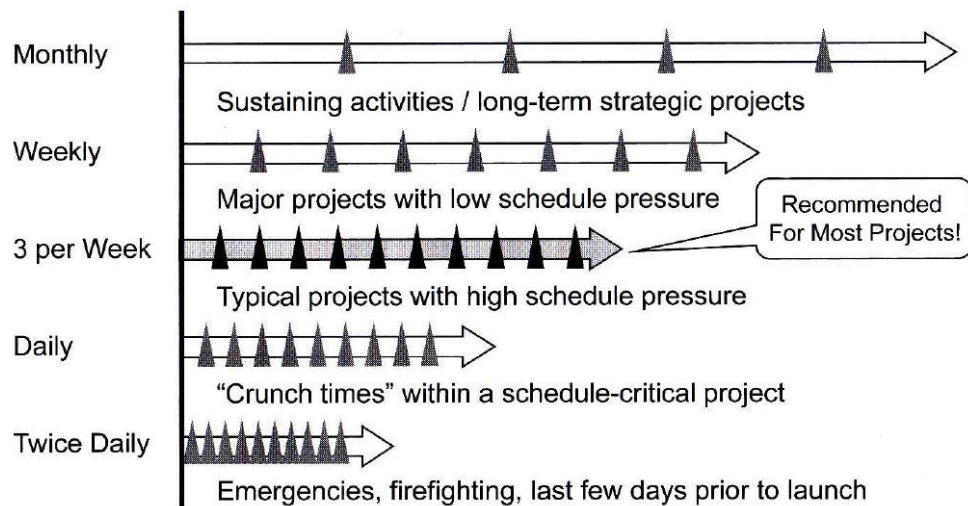


Figure 2 Frequencies of stand-up meetings. (Mascitelli 2011, 87.)

The purpose of the stand-up meetings is to activate the team members, which consequently should increase productivity and communication along with reducing waste. It is important to give the team independence as well as promote active problem solving and some decision making. If the individuals are not inspired to think about their own tasks and the project in general together with predicting what might occur in the project work, the mind goes easily numb. When doing routine work for a long time, the individual becomes passive. The skills to do so are there and they should be utilized for the benefit of the organization and the individual. Stand-up meetings provide an outlet to be more involved in the workflow management and hopefully motivate the team members to take responsibility and a more active role. (Spiik 2003, 76.)

3.4 Team metrics

Valuable information about the team performance and resource utilization can be generated from the sticky notes pulled from the visual project board's wall-Gantt section. From the sticky notes different kinds of team metrics can be created quite simply. Gathering the data and creating the diagrams does not require a lot of effort nor does it consume a lot of time. What should be considered first is what would be valuable information for the team or management to get from the team metrics. (Mascitelli 2011, 107.)

When it is decided, what information is wanted from the team metrics, the next step is instructing the team. For example if the team metrics require a certain types of color coding or certain markings are needed in the sticky notes, this should be communicated to the team at the beginning. After that the data gathering for the team metrics can be done in many different ways. It should be easy and time efficient. One way to do it, is to take a blank page and just with couple lines drawn across the paper, designated areas can be assigned for the sticky notes pulled from the board. (Mascitelli 2011, 108.)

One option is to create a team's on-time performance histogram, which could be used to analyze how accurately the deadlines for the tasks can be planned, how well deadlines are met and how often different issues postpone deadlines. Sticky notes can be categorized for this purpose just by checking if there are new deadlines marked in the sticky note, when it is pulled from the board as completed. So at that point no additional work is required, as the deadlines are updated in the sticky notes anyway. Sticky notes could be categorized to four piles, for example completed on time, one slip, two slips, and three slips or more. The histogram could show the results as percentages of all tasks completed and it could be updated quite easily on a weekly basis. (Mascitelli 2011, 108–109.)

With just a little bit of extra effort, a graphical presentation of the resource utilization could be created also with the sticky notes. This would require categorizing different types of tasks and assigning a sticky note color for each of them. Different categories could be for example planned project tasks, unplanned project tasks, sustaining support tasks, and other non-project tasks. This kind of chart could provide valuable information concerning resource conflicts, if team members have many non-project tasks, and also in identifying how tasks are distributed in these categories. (Mascitelli 2011, 108–109.)

Team metrics generated from the wall-Gantt's task notes can bring many benefits for the team. As mentioned in the previous chapters, team metrics can show if there is a need to improve for example estimating completion times or if some actions are needed, in order to get the team members enough time to focus primarily on the project work. On top of these, team metrics can also inspire the team to thrive for improvement and give a sense of accomplishment, consequently increasing motivation and efficiency.

3.5 Multi-Project Visual Board

There are also ways to modify the visual project board concept into a multi-project visual board, which means employing this visual management tool for several projects in the same platform. This change is actually quite easy to carry out by modifying just a few sections on the board, but first it should be considered if it is the best solution for the situation under consideration. If the projects in question are extensive, it might be more practical to implement separate visual project boards for each of them. On the contrary, if the projects are not that extensive in scale or if there are many projects on-going at the same time, the best solution could be the multi-project visual board. (Mascitelli 2011, 102.)

Altering the single-project visual board into a multi-project visual board should start by deciding how to present the milestones of the projects. This is the section of the visual project board, which generates smaller tasks to the wall-Gantt section and shows the status of the project along with upcoming milestones. If there only a few activities to manage, one option is to have individual project status sheets and have those stacked up on the board. However, when the number of activities grows, this approach might

quickly turn out to be impractical. Another option is to utilize a project cadence tool (see Figure 3) instead of the separate project status sheets or in addition to summarize all the projects. With the project cadence tool it is also easy to compare projects, for example in regards to progress and completion dates. (Mascitelli 2011, 103.)

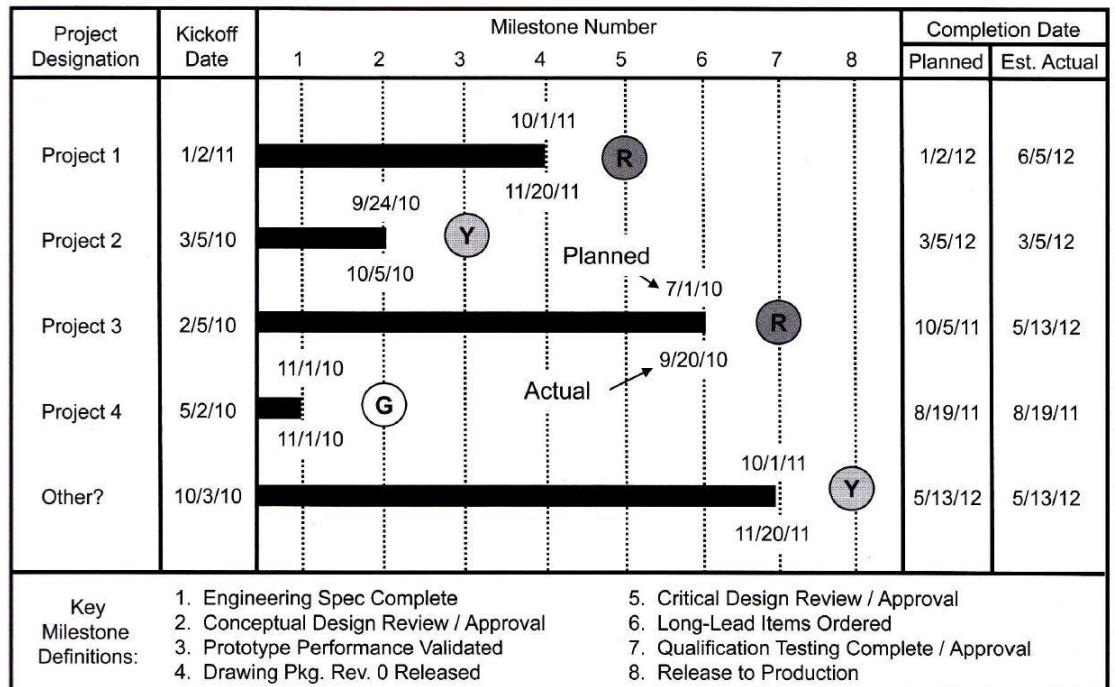


Figure 3 Example of a project cadence tool. (Mascitelli 2011, 105.)

In the project cadence tool there can be unlimited number of projects tracked in the same template without misperception, and that is one of the most important qualities in this tool. All projects are listed on the left next to the kickoff date column. After the kickoff dates, there are the progress bars and completion dates (planned and estimated actual). Below all these columns are the standard milestones. The milestones should be a predefined set of progress points, which are suitable for the projects included in the cadence tool. If some of the projects do not have all the same milestones, it does not prevent including those in the tracking tool because those milestones can then be just passed over. The number of milestones can be determined without restrictions, for example between eight and twelve should be fine, to suit the projects in question. (Mascitelli 2011, 103–104.)

The progress bars on the cadence tool extend to the latest achievements. As it is indicated in Figure 3, the planned date for the latest completed milestone is shown above the progress bar and the actual completion date is below it. Additionally the general status of the project can also be added at the end of the progress bar with simple red, yellow, and green status symbols. The project status can be determined by for example cost, schedule, performance, or all three combined together. Also several status symbols can be presented in the cadence tool, if it creates value for the team or the management. (Mascitelli 2011, 103.)

All things considered the project cadence tool is quite versatile and modifiable for different requirements. One benefit is also the absence of a fixed timeline of weeks or months as the progress is measured with the milestones. This feature enables presenting projects with different durations in the same platform. If there is a need to add more details to the milestone section of the multi-project visual board (for example unplanned tasks) a combined action tracking sheet, with a column for identifying which project is in question, can be added. (Mascitelli 2011, 103–104.)

Also the wall-Gantt section of this visual management tool should be modified in order to include tasks of several projects instead of just one. This change can be facilitated just by changing the meaning of the colors of the sticky notes. One unique sticky note color should be assigned for each project and all tasks related to the same project are in the unified color. If the priority of the tasks needs to be incorporated, this can be achieved by adding different colors of sticky dots to indicate the priority. If the project cadence tool is in use next to the wall-Gantt section, the assigned colors of the projects can be presented in the project list of the cadence tool template. (Mascitelli 2011, 104.)

There are basically two ways how to conduct the visual workflow management with the multi-project visual board's wall-Gantt section. If there is little overlapping with the resources of the projects, the project teams can have separate stand-up meetings at different times focusing on just one project and the one color related with that project. Quite often there is overlapping and in that case, it is best to have multi-project stand-up meetings and go through all projects in the same meeting. This is not as chaotic as it might sound because each team member goes through the tasks just like in single-project meeting, the tasks are just scattered between several projects. (Mascitelli 2011, 107.)

4 CURRENT SITUATION

Product Engineering is now the largest department at Parker Forssa. As much as over 60 % of all the employees are working in the Product Engineering Department. The Product Engineering staff consists of a software team, a hardware team and administrative personnel. There is an Engineering Manager, who is the superior for all the Product Engineering staff, two Project Managers, a Project Coordinator and Design Engineers. Through discussions with the design engineers and project managers as well as research within the company, the current situation of the project management tools at Parker Forssa was studied and the observations are delivered in the following chapters.

4.1 Current project management tools

There are always several active projects under work simultaneously at Parker Forssa Product Engineering. Some are new product development projects and some are more or less based on already existing products. Projects are tracked in different ways and also the level of tracking de-

depends on the project. Some projects are monitored more closely than others.

Each project has a unique project number, which consists of four digits. In the work hour tracking project managers and designers specify with project numbers, which projects they have worked on and for how long. These inputs are gathered monthly and the hours are documented for each project in an Excel-file. Also other costs are monthly recorded separately for each project as well as project related sales. All projects, which have work hours and/or costs tracked, have a unique project number set up in the work time monitoring system as well as in the Enterprise Resource Planning system in order to gather the related data.

Parker is also utilizing a project management tool called Winovation and it is also in use at Parker Forssa. It is a business system designed to guide through the whole process from an idea to product launch and it is web based. It is a tool that is created on the Stage Gate principle with the purpose of driving profitable and sustainable growth as well as providing a balance between creativity and execution amongst other objectives. Projects are added into the Winovation system and their progress is tracked there.

The Stage Gate process ensures that there are the best possible chances for success. It consists of five gates, which divide the process into six phases. These phases are discovery, concept, feasibility, development, qualification & pre-production and launch. In the discovery phase there are ideas and after the first gate these ideas, which go through to concept phase, are formed into projects. These projects have to go through the gates in order to step into the next phase of the process and later on these projects progress to products heading for launch. Each gate has to be passed before a product can proceed to the launch phase. Gates are the go or kill points which define if the project can go forward or not. There are predetermined criteria which need to be achieved in the gate review in order to pass and there are certain deliverables which need to be ready beforehand. For example the status of the deliverables and the upcoming gates for each project are monitored in the Winovation system.

The new product development process at Parker Forssa has been actually developed to support the Winovation tracking system and the Stage Gate. The first two phases, discovery and concept, are more to do with the sales and marketing, so those are not included in the new product development process. At the feasibility phase the project comes to Product Engineering Department and that is why the new product development process starts from the feasibility phase. The process map is presented with four sections; feasibility, development, qualification and launch. Also the gates are included in the process map, so the process and the Winovation tool are linked.

Concerning human resources management, more precisely task management, Parker Forssa has been using a Resource Planner. This management tool is just an Excel-file, which is used to assign tasks for the Product En-

gineering employees included in new product design or sustainability and improvement related projects. On Fridays there is a weekly resource planner meeting, including mainly project managers. Tasks are discussed amongst the project managers of Parker Forssa and they are documented in the Resource Planner Excel-file for each engineer.

The Resource Planner list can be sorted by name to see what has been assigned to each employee involved in the projects. Each row in the list includes the name of the person responsible, a short description of the task and the task type, the estimated time the task takes to complete, the priority when the task should be done as well as the related project and customer information. All these are filled into the Excel-file by the project managers. Sometimes the engineers are consulted concerning the estimated completion times in the Resource Planner, but most times the estimations and deadlines come from the project managers.

When the Resource Planner has been updated with the latest tasks, the employees included in it also need to be informed about these. There have been two methods for this. One is by sorting the list to show a specific engineer's work list and to make a PDF-file from the list and then sending it to the person in question. Especially if there have been last minute changes, the other method has been that the engineer is informed when the list is ready in the Resource Planner, and then the person in question has been able to go to check the work list directly from the Excel-file.

Most of the software engineers actually have office space in Tampere and they utilize a methodology called scrum for managing their tasks. Scrum has been developed for supporting software development's workflow process in product development. The name 'scrum' comes from rugby and it refers to a tight group of players together aiming to get the ball. In a way that is also the desired result for the software development team; to be committed as a tight group working together towards a common goal. One of the project managers at Parker Forssa, who works closely with the software team, stated that commitment is exactly what they also wanted to achieve and also add motivation and structure as well as improve the planning and scheduling.

Scrum has three main players: the product owner, the stakeholders and the development team. One of the most important aspects of this methodology is being able to adapt to changes in the requirements and also to upcoming issues. Another important factor is communication between these three and also the ability to say no. Not all requests from the stakeholders are feasible to be implemented and the person in the product owner role determines whether the request is denied or if it is added to the work list known as the product backlog. The team works in two-week sprints and from the product backlog tasks are moved to the sprint backlog during the sprint planning meeting and the product owner prioritizes the requests. There can be only a specific number of requests set for one sprint, but there is also a "nice to have" -list, which is tackled if all the requests from the sprint backlog are ready before the end of the sprint. The development team should deliver the results to the stakeholders after each sprint. This is

the idea of scrum plainly explained and it has worked quite well with the software team of Parker Forssa.

4.2 Challenges and problems with the current project management tools

Through the discussions and research at Parker Forssa Product Engineering it was noticed that there are some challenges and problems with the current project management tools, more specifically with the workflow management tools. Challenges were discussed with the project managers and some of the engineers. In the following chapters there are excerpts from these discussions.

The Resource Planner, which is described in the current situation, was developed for an urgent need under circumstances, which could be described as even slightly chaotic. At that time the Product Engineering Department at Parker Forssa was all over the place with many active projects on-going at the same time and also with quite big changes in the staff. The Resource Planner tool was a sufficient answer to that need at that time as it gave control into the situation. Now there are not as many projects under way in parallel so different kinds of workflow management tools can be considered to incorporate lean principals to this part of the business.

There are certain aspects of the Resource Planner that could be improved and also a lean approach could be implemented. One of the biggest challenges with the Resource Planner is the lack of team participation in the planning, defining, and scheduling of tasks. The project managers define in the Resource Planner -Excel what should be done, as well as when the task should be done, and how long it will take to complete it. The person actually performing the task is not included in these decisions.

The Resource Planner work lists are distributed by email or the work list is checked directly from the Excel-file. This method of distributing tasks is quite impersonal and lacks communication. Quite many tasks also depend on how other tasks are progressing but when distributing the tasks in this way; there is no possibility for open conversation amongst the team when scheduling tasks. Many things might come as a surprise later on and cause issues, such as disruption and inefficiency in the workflow as well as missing deadlines, purely due to a lack of direct communication within the team.

As mentioned earlier, in the current situation, there have already been changes concerning the workflow management in the software team. The software team utilizes scrum with their task management and that has been working well for them. Unfortunately scrum is not suitable for the task management of the hardware team, so the challenge is actually, what would be an appropriate workflow management tool for the hardware team and how to implement and maintain it.

There is also a challenge to get the team on board for changes. When implementing new methods of working it always requires some learning and adjusting to the new ways of doing things from the team. Consequently

that might raise some change resistance. Activating the team is one challenge, which should be considered when introducing something new, which requires participation from everyone in the team.

One problem mentioned by one of the project managers is the inability to measure the team's performance. It would be valuable information to somehow measure whether the team is doing well or not. It has also been a challenge to just quickly summarize the status of the work to see where we are at the moment with the team's tasks and progress. When considering overall the current situation of the project management tools in use at Parker Forssa, it seems that the higher level management tools are in place and the software team is doing well with the scrum, so the challenge is with the workflow management of the hardware team and the human engineering tools.

5 IMPLEMENTATION OF A VISUAL PROJECT BOARD

At Parker Forssa a visual project board was applied in the Product Engineering Department. It was implemented as a single-project form so the executed visual project board comprehended only one project at this point. This new product development project in question had already started before the visual project board was implemented. Target group of this visual project board is the hardware team but also some activities of the supply chain team and the software team have been included in the board. The core team, who is using the visual project board regularly for tracking their tasks, involves six design engineers and the project manager. In the stand-up meetings, held at the visual project board, there have been also participants from other departments related to the project as well as other managers and engineers from the Product Engineering Department.

5.1 Planning and preparations

First step in the planning and preparations of the visual project board was discussions with the managers as well as the design engineers about how this visual project board should be implemented. There were some concerns about the location, where this board and the stand-up meetings would take place, and how to get the team on board with this new visual project management tool. Both concerns were addressed during the implementation.

The board was located to an empty workspace, which is really close to most team members' usual workspaces. The area was cleared and rearranged to have more space to use the board and to get a better view also from further, when having the stand-up meetings at the board. Also another board was added next to the existing one to have sufficient space for all the visual project board sections. A header was made according to the Parker's brand book and it was positioned above the whiteboards, to make the new area stand out and have it clearly indicated.

Next step was to decide, which sections would be included in the visual project board. With the project manager, it was decided to start with project timeline, milestones (planned tasks), upcoming tasks (unplanned tasks), risks, and of course the wall-Gantt. The upcoming tasks section works as the parking lot of the visual project board, as this is the area where also sudden issues can be added as they come up.

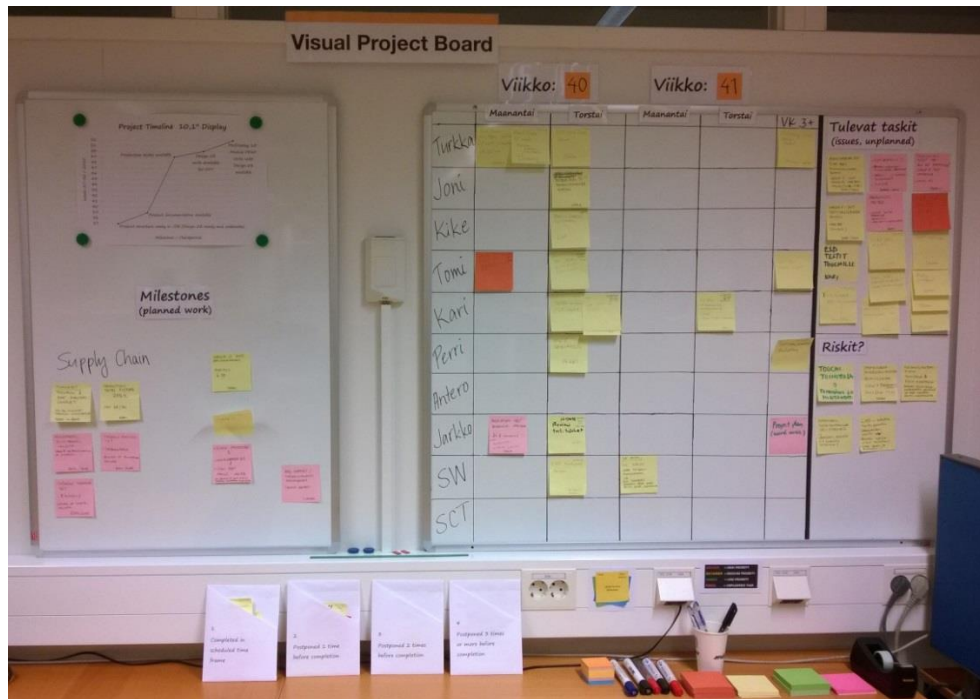


Figure 4 Picture of the visual project board implemented at Parker Forssa.

After deciding the sections, the team members included in the board as well as the number of stand-up meetings per week needed to be defined before actually organizing all the parts on the boards. When all these were clear, the visual project board was set up and the necessary supplies prepared. As can be seen in Figure 4, the project timeline was positioned in the smaller whiteboard with the milestones and the wall-Gantt as well as upcoming tasks and risks were located in the bigger whiteboard. Under the visual project board is desk space, where sticky notes can be written. On the desk there are also four paper pockets, where all the completed sticky notes are collected. This way the completed sticky notes are categorized whether they were postponed or not, and if so, how many times rescheduling was required before completion.

One of the most important objectives in the visual project board implementation was getting the team to really utilize it. One concern that came up in the discussions before the implementation, was how to get the team activated and on board with using this new tool for task management. It was anticipated that if the utilization of the visual project board and the stand-up meetings was clearly instructed and easy to take into use, it would help getting the team to benefit from them. So the effort was to make the use of the visual project board as clear and easy as possible.

It was decided that four different colors of sticky notes would be used with the visual project board. Three colors were assigned to priority classifications and one color for unplanned tasks. Orange color is for high priority tasks, yellow for medium priority, and the green notes for low priority tasks, which can be postponed with little complications or none at all. The pink ones are for the unplanned tasks.



Figure 5 Picture of the visual project board's sticky note desk area.

With the ease of usage and the need for clear instructions in mind, the meanings of the different sticky note colors were added next to the desk area, where all the sticky notes are written (see Figure 5). Also a compact instruction about what should be written on each sticky note before placing it on the board was included, as is shown in the left corner of Figure 5.

5.2 Observation period

Utilizing the visual project board was observed closely during the first six weeks of implementation, so from the week 37 to the end of week 42. It was decided with the project manager that the stand-up meetings are held twice a week on Mondays and Thursdays at 10 am. In the first meeting a short introduction to the use of the visual project board together with the stand-up meetings and the concept in general was presented. Due to this introductory presentation, the first meeting was a bit longer than what the stand-up meetings should be, but after that all stand-up meetings during the six weeks were around fifteen minutes, sometimes a bit more and sometimes a bit less. None of the meetings expanded over twenty minutes, which was quite surprising as one of the doubts beforehand was keeping up with the fast pace of the stand-up meeting.

At one point during the observation period, it was noticed that there were quite a lot of questions about purchase orders, as prototype parts were expected. As this was considered to be valuable information for the team, a part of the whiteboard on the left was assigned for the orders. So there were all the important orders listed, including the name of the supplier,

what has been ordered, and when to expect them to be delivered. Each time something from this list was received, it was updated in the list. So the team members were able to check from there if the items they needed were ordered and when they should be delivered or if they were already received by someone in the team.

All the completed tasks from the wall-Gantt were collected during the six weeks and they were categorized into four groups; completed in scheduled time frame, postponed once before completion, postponed twice before completion, and postponed three times or more before completion. When a task was completed, it was placed in the right paper pocket, as mentioned in a previous chapter. At the end of week 42 the task notes in the pockets were calculated. Figure 6 shows a graphical presentation of how big percentage of all tasks completed each category comprehended.

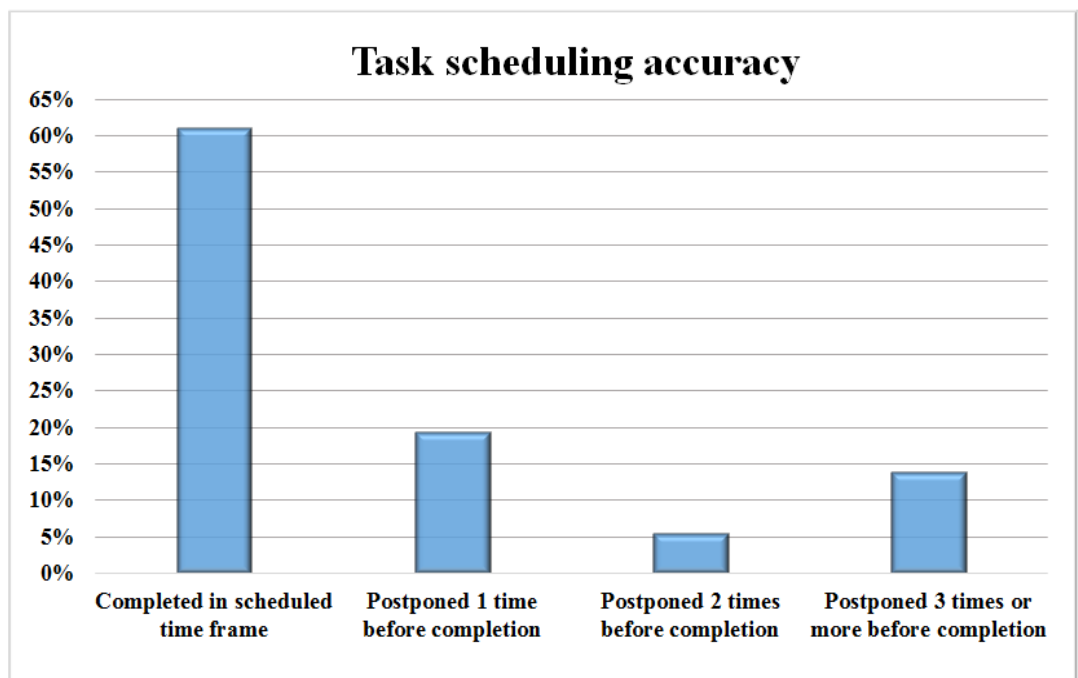


Figure 6 Graphical presentation of how accurately tasks were scheduled.

Estimating how long it takes to complete a task can be rather challenging, especially if not used to doing it and if there are external factors, which might affect the completion time. For a group, which is not very familiar with estimating a completion time for each of their tasks, this result of over 60 % of all tasks were completed in the scheduled time frame is quite good. This kind of workflow management requires learning from the whole team, so improvement in scheduling can be expected. As mentioned, these scheduling accuracies in Figure 6 are from the first six weeks of having this type of management tool in use. The last category, postponed three times or more, should not be that high, as rescheduling that many times can really affect the project timeline, however sometimes the delays are not under the team's control.

5.3 Survey and results

At the end of the week 42, which was the last week of the observation period, a survey was conducted for the managers and the engineers related to the implementation of the visual project board. All were able to participate in the survey and it was conducted in Finnish, as it is the native language of all the participants. It was decided to have different survey questions for the engineers and the managers, as they see it from a different perspective. Both sets of questions are included in the appendices at the end of this thesis and they are translated to English. There were four main parts in the survey for the engineers. These parts were associated with information flow, tasks, stand-up meetings, and whether the old method of task management is more preferred by the design engineers than this new lean visual management tool.

First question for the engineers was have they received useful information from the visual project board or stand-up meetings. This was a multiple choice question and most of them chose the first one, which was frequently. Only two of the replies were in the second one, which was seldom, and nobody chose the last one, which was never. It is worth mentioning, that the two who answered seldom, were not active users of the board as their main focus was not in that particular project, which was tracked on the visual project board, and the subjects discussed did not impact their work.

In the first part of the survey, which was information flow, also improvement suggestions were requested. Two design engineers brought up the deficiency of incorporating information flow from the software team with the visual project board and the stand-up meetings. This is a challenge and there were times during the observation period, when information from the software team was required and they were not represented. Software team is physically located in a different facility in Tampere and they have their own task management system, which is scrum. During the observation period those who would have known about the software tasks in Forssa, were quite busy and they were not able to attend most of the stand-up meetings. Then again one comment in the survey was that it might be a good thing to go through the software related issues in their own forum.

In the part related with the tasks, it was inquired, whether the design engineers prefer to have the tasks and deadlines defined for them by the project managers or if they want to define these for themselves. Every single one answered that they want to continue with this new system, that they define the tasks and deadlines by themselves. There were comments in the replies that this is a good system and it is good that this way, the responsibility is shared.

First question about the stand-up meetings was how often a stand-up meeting should be held. This was a multiple choice question and there were five options, from once a week to daily. All, except for one engineer, chose twice a week. The one deviant reply was once a week, due to the short time period between Thursday and Monday. It is quite difficult to choose two days out of five workdays for the stand-up meetings, which would be suitable for everyone. Second question was about opinions on

the stand-up meetings. Feedback was really positive and couple concerns were raised. One concern was that the discussions in stand-up meetings might get side-tracked and prolong the meeting, so this kind of discussions, which are not interesting for the whole team present, should have a separate forum. Another concern was how to link several team schedules, as the tasks might be dependent on each other even though they are performed by separate teams.

Earlier this team, which participated in the implementation of the visual project board, had the Resource Planner in use as the task management tool. Utilizing the visual project board's wall-Gantt and having the stand-up meetings twice a week have replaced the Resource Planner and the work lists generated based on it. Towards the end of the engineers' survey, it was inquired, which method they think is more suitable for this team. Every single one answered that the visual project board and the stand-up meetings are more suitable as the team's task management method.

Feedback from the managers was also really positive and they felt that we have succeeded with this implementation. There were comments in the managers' replies that the team members have now been more aware of the progress of the project and the quick stand-up meetings have suited this team well. Also a more active role was hoped from the team, in terms of actively finding solutions for problems and creating new tasks. One improvement suggestion from a manager was to integrate the visual project board with the main project schedule in Microsoft Project.

6 DEVELOPMENT PLAN

Feedback from the survey was positive from the engineers as well as from the managers, so the use of the visual project board and the stand-up meetings should definitely be continued. In the following chapters there are suggestions how to proceed with the visual management tools, guidelines how these could be implemented, and what are the recommended methods for monitoring and sustaining.

6.1 Suggestions

During the observation period of the visual project board implementation, only one project was tracked on the board and in the stand-up meetings. This also means that only this certain project's tasks were included in the wall-Gantt section of the visual project board. The Product Engineering Department of Parker Forssa usually has several projects on-going at the same time, so it would be more useful and lean to modify the single-project visual board to a multi-project visual board. This change would also mean that all tasks are included in the wall-Gantt, so it is easier to comprehend how much each team member has tasks from all the on-going projects.

In the survey, one of the design engineers commented that the project schedule is not clearly presented in the visual project board or in the stand-

up meetings. This is an issue that should be addressed. One section in the visual project board was the project timeline, which was a line chart presentation with the major milestones for the rest of the year. This section of the visual project board was a bit unappreciated and unnoticed. It was mentioned in the beginning of the implementation, but after that it got forgotten and it was not taken seriously. Really often the team members would ask what the project schedule is and it seemed that the project timeline did not answer that question. In the future it would be valuable for the team to have a clear picture of what the project schedule is.

From the managers one really good point was integrating the main project schedule, which is in Microsoft Project format, with the visual project board. With the lean methodology in mind, succeeding in this would be great improvement, as it would reduce the time spent in updating the main project schedule. Project managers could perform the same task in less time if there would be at least some type of link between the project schedule and the visual project board, as the tasks are tracked there but still the progress also needs to be updated in the main project schedule.

One more suggestion would be incorporating the software team a bit more in the visual project board and the stand-up meetings. Software team has their own scrum method and they should continue with that, which means that the actual task management of the software team should not be included in the same platform. Also not all software issues should be discussed in the stand-up meetings, when software related topic requires further deliberation a separate meeting should be arranged for that. The whole concept of the visual project board and stand-up meetings would lose its meaning if these expand to laborious instead of fast, easy and efficient.

6.2 Implementation

The implementation of modifying a single-project visual board to a multi-project visual board was explained in the related chapter. So the first steps would be changing the meanings of the sticky note colors and incorporating all the projects, included in the implementation, in a project cadence tool. The project cadence tool is an excellent choice in this case, as the new product development projects have fairly similar milestones, which form the structure for the project cadence tool. All the required changes could be done quite easily in the current set up, so taking the multi-project visual board in to use would not be too time constraining.

The project schedule needs to be presented more clearly. This could be implemented by changing the visual presentation of the project schedule, but that on its own will not probably be sufficient. The chosen method for presenting the project schedule during the observation period was the line chart, which was clear and easy to comprehend, but it should have been reinforced as well. It should have been referred to when scheduling the tasks, so it would have been noted. So whatever is the method of presenting the project timeline in the future, it should also be mentioned and referred to during the stand-up meetings. And also, if there are changes to

the project timeline, these should also be explained for the whole team and updated to the project timeline, which the team should comply with.

There are definite benefits in integrating the project plan in Microsoft Project with the visual project board and the stand-up meetings. What would be the best way to implement this is something that the commissioning company should study further. One option or more like the first step for the implementation could be coordinating the different stages and milestones in the main project plan with the structure of the visual project board. Without further investigation it is difficult to estimate how extensive this type of change would be and consider additional improvements or substitute actions. Perhaps even a different type of project planning tool in electrical format could be considered, nonetheless the requirements of the project plan should be examined and then the use of it should be streamlined and the time spent on updating it should be optimized.

Implementing the incorporation of the software team with the visual project board and the stand-up meetings is quite a challenge. Key to success with this one is implementing it at a reasonable level. More information from the software team is essential in the stand-up meetings and on the board, but full participation is neither required nor desired. Good start would be having one from the software team more involved with the visual project board and the stand-up meetings or educating the whole software team to understand these management tools and then they could take turns, who is responsible for informing the latest issues as well as updating the status of the software related tasks and deadlines.

6.3 Sustaining and monitoring

It is fairly easy to take on new ideas but harder to strive to implement, sustain, monitor, and improve them appropriately. In order to sustain the changes already implemented at Parker Forssa Product Engineering Department it requires consistency and ability to listen and to be heard. The guidelines of the visual project board and the stand-up meetings should be clear to everyone and they should be followed consistently and also the meetings should be held consistently. Listening to the team members is important, so that there is a feel of unity and working as a team. Team members should really listen to each other actively, including the project manager. Just as important is also being heard. For example if there is a situation in a stand-up meeting, that one discussion is overpowering the meeting, it is important to be able to communicate, that the discussion should be continued after the meeting or at a different time, so that the rest of the team is not alienated in that situation.

Monitoring the utilization of the visual management tools, the progress of each on-going project, the team's performance, and resource allocation is also highly important. Different types of team metrics and how to implement them were presented in the related chapter. With the wall-Gantt section of the visual project board there are quite many different options what could be monitored, based on what would be valuable information for the team or for the management. If the multi-project visual board is imple-

mented, then it would be quite easy to monitor how the tasks are divided between the projects and perhaps also for non-project related activities. Also the scheduling accuracy could be monitored also in the future, as it does not require much additional effort to achieve.

7 CONCLUSIONS

The whole process of this thesis work has been really interesting and educating. Studying this topic and implementing the visual project board at Parker Forssa has taught a lot. Also participating in the stand-up meetings twice a week has broaden the understanding of how much is included in a new product development project and what type of problems can occur and what kind of consequences they might create and what are the effects on the project. It is beneficial to have also this type of management tool as visual project board, which is not in electrical format, to have people interacting and communicating. In this type of gatherings, where each team member has a turn to discuss their tasks, it is a lot easier to notice different types of things and additionally learn from each other. For instance, it could be noticed if someone would need assistance in some of the tasks, if some training would be required, or if someone is under too much pressure.

At the beginning of the implementation of the visual project board there was a bit of change resistance, but it passed rather quickly. There are really different kinds of personalities in this team, which is a good thing, even though it might sometimes create conflicts. Also conflicts can be beneficial if they are handled in a proper manner, as they might generate new ideas. It was really nice to notice that there were those, who comprehended the guidelines almost immediately and wanted to follow them closely, as they were also the ones that helped the others, who most likely were not too bothered in the beginning to learn anything new.

Before the implementation it was decided that the observation period would last six weeks and it was a suitable time frame. It took quite a long time to get all of the team members accustomed to the stand-up meetings and the use of the wall-Gantt, so it was good that the time period did not end at that point. After the observation period the team members suggested that the stand-up meeting on Monday would be moved from morning to afternoon, before the afternoon coffee break, to even the time periods between the stand-up meetings. This showed that now the team had really adopted this new method of task management and it was really important that this suggestion from the users of the wall-Gantt was heard and considered. It was decided that the stand-up meeting on Monday is moved to afternoon and later on adjusted again if necessary.

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SURVEY QUESTIONS FOR THE ENGINEERS

Visual Project Board & Stand-up Meetings

Information Flow

One purpose of the visual project board and the stand-up meetings is to distribute information about the status of the project. Which tasks are on-going, what is the status of them and when each task has deadline. Additionally we have had the project timeline (project milestones), delivery dates for purchase orders, upcoming tasks, possible risks, etc.

Have you received useful information concerning the project from the visual project board or from the stand-up meetings:

- ☐ Frequently (I have checked something from the board, for example concerning tasks or timetable, or something interesting and relevant for my tasks or the project in general has come up in a meeting).
- ☐ Seldom (there has not really been much information that would interest me on the board and I haven't often received useful information in the meetings).
- ☐ Never (not once has there been any useful information for me on the board or in the meetings).

Do you have any improvement suggestions, e.g. what information should be added to the board or things, which would be worthwhile going through in the stand-up meetings?

Tasks

According to the concept everyone defined their own tasks in the sticky notes and estimated, when the task is done. This way it is clearer, what the task includes, for the one executing the task, rather than task descriptions written by others. Also the one doing the task usually has the best knowledge on how long it will take to complete the task and what other tasks are worked in parallel at that time.

What do you think about this concept?



Choose the ones, which are true for you:

- ☐ I want to define my tasks also in the future.
- ☐ In the future, I want the project manager to define the tasks.
- ☐ I want to estimate, when my task might be done, also in the future.
- ☐ In the future, I want the project manager to estimate, when the tasks might be done.

Stand-up Meetings

We have held a stand-up meeting twice a week, where we have gone through tasks scheduled for that day (so all the tasks, which have been estimated to be ready at that time). In the stand-up meetings we have also had general discussions (concerning for example suppliers, issues, orders/acquisition proposals, and testing). First meeting was a bit longer, but after that every meeting has been around 15-20 minutes. Meetings have been held on Mondays and Thursdays at 10 am.

How often do you think it would be good to go through the on-going tasks and the status of the project in a quick stand-up meeting:

- ☐ Once a week
- ☐ Twice a week
- ☐ Three times per week
- ☐ Four times per week
- ☐ Daily

What do you think about these stand-up meetings? Improvement suggestions?

Visual Project Board & Stand-up Meetings vs. Resource Planner

Previously we utilized a Resource Planner for task management, which the project managers updated once a week. Project managers defined the tasks and estimated how long they will take. Work lists were sent by email or checked from the Excel-file.

What do you think, which one have been more suitable for this team:

☐ Visual Project Board & Stand-up Meetings

☐ Resource Planner

Comments / Feedback

All feedback and comments are welcome:

SURVEY QUESTIONS FOR THE MANAGERS

Visual Project Board & Stand-up Meetings

Feedback / comments about the Visual Project Board

Beforehand it was considered if for example the proposed location for the board works and is there enough space near the board for the stand-up meetings and what should be included in the board. It was decided that the board will be located as proposed, but another board is added next to it to add space. Surroundings of the board was altered a bit and cleared to accomplish more space and a better view also from a bit further. The contents of the board has changed a bit during these six weeks, some information has been added; for example delivery dates of purchase orders for the project. Otherwise the sections of the board have not really changed (wall-Gantt, upcoming tasks, risks, milestones, and project timeline).

What do you think about the implementation of the visual project board? Improvement suggestions?

Feedback / comments about the Stand-up Meetings

Before creating the layout for the board, the number of weekly meetings was considered as well as the duration and time. It was decided that we will have with two stand-up meetings per week, on Mondays and Thursdays, at 10 am. The first meeting was a bit longer, because we went through the idea of the board and how we are going to use it. From the second meeting forward the duration of the meetings have been around 15-20 minutes, also including general discussions concerning the project.

What do you think about the stand-up meetings and how have we managed? Should there be some changes, e.g. with the number of meetings per week?

Lastly

Does it seem like this concept has been useful and it should be continued?

How do you think the team members have taken this new concept?

Have you noticed any problems / challenges?

